

Before the  
Federal Communications Commission  
Washington, D.C.

RECEIVED

SEP - 3 1996

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

In the Matter of )

Revision of the Commission's Rules )

To Ensure Compatibility with )

Enhanced 911 Emergency Calling Systems )

CC Docket No. 94-102

RM-8143

DOCKET FILE COPY ORIGINAL

**PETITION FOR RECONSIDERATION AND CLARIFICATION**

Mark J. Tauber  
Kecia Boney  
Mark J. O'Connor

Piper & Marbury L.L.P.  
1200 19th Street, N.W.  
Seventh Floor  
Washington, D.C. 20036  
(202) 861-3900

Its Attorneys

Date: September 3, 1996

No. of Copies rec'd 0411  
List A B C D E  
\_\_\_\_\_

## TABLE OF CONTENTS

	PAGE
SUMMARY .....	i
I. The Definition of "Mobile Identification Number" Should Be Technologically Neutral.....	2
II. Distinctions Between Calls With and Without a Valid Code Identification Should Be Removed .....	4
A. The Operator Should Be Responsible for "Best Efforts" Routing to the "Designated" PSAP But No More .....	4
B. Routing to the Appropriate PSAP Will Serve the Public Interest and Limit Licensees' Potential Civil Liability.....	5
C. Proposed Alternative Rule Changes to Improve Public Safety and PCS Liability Issues.....	7
III. TTY Requirements Must Be Further Clarified .....	8
A. Telephone Number Differences .....	9
B. TTY Compatibility with Digital Systems.....	9
C. Short Message Service Could Provide A Workable Solution .....	14
IV. Relax the Applicability of Section 20.18(d) .....	15
V. Funding of Network Improvements.....	19
Conclusion .....	21

## **SUMMARY**

Omnipoint respectfully asks the Commission to reconsider and/or clarify several aspects of its E911 Order. The rules, as currently drafted, pose significant implementation problems and fail to apply in a consistent manner across competing PCS technologies. Omnipoint requests that the Commission reform its E911 rules in the following ways:

1. The definition of "mobile identification number" should be modified so that it applies equally to all technologies and captures the information the Commission seeks in its Order.
2. All 911 calls, including those with a Code Identification, should be routed to the designated PSAP in a uniform manner. Alternatively, only calls with a Code Identification should be transmitted to the PSAP; the PCS licensee should not be required to accept 911 calls without a Code Identification.
3. TTY requirements must be further clarified for operators employing digital systems. The TTY requirements should provide for Short Message Service offered by many PCS operators and analog TTY service, to the extent reasonably feasible, to be offered by licensees.
4. A licensee should be required to use the best commercially reasonable techniques for ascertaining a 911 caller's location, as is consistent with the licensee's transmission technology. In no case should a licensee be required to build additional sites or add transmitters in order to comply with location requirements.
5. Since a single PSAP could force a CMRS operator to make significant changes in its network, the operator should be able to recover *all* operational and capital costs from a PSAP that requires it to make E911 service available. Where the PSAP does not pay up-front for the licensee's costs, the PSAP should compensate the licensee for opportunity costs lost in addition to all operating and capital costs.

**Before the  
Federal Communications Commission  
Washington, D.C.**

In the Matter of	)	
	)	
Revision of the Commission's Rules	)	CC Docket No. 94-102
To Ensure Compatibility with	)	RM-8143
Enhanced 911 Emergency Calling Systems	)	

**PETITION FOR RECONSIDERATION AND CLARIFICATION**

Omnipoint Communications, Inc. ("OCI" or "Omnipoint"), by its attorneys and pursuant to Section 1.429 of the Commission's rules, files this petition for reconsideration and clarification of the Commission's Report and Order<sup>1</sup> (the "Report and Order") in the above-referenced docket.

As the Commission recognizes, implementation of the Commission's enhanced 911 ("E911") policies with today's various wireless networks and technologies involves highly complicated issues. Report and Order at ¶ 7. Several aspects of the Report and Order require further clarification and reconsideration from the Commission in order for OCI and other CMRS providers to implement E911 in a responsible and effective manner.

Omnipoint respectfully submits that aspects of the E911 rules contradict the Commission's deliberate policy to remain neutral on PCS technologies competing in the

---

<sup>1</sup> Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Report and Order and Further Notice of Proposed Rule Making, CC Dkt. No. 94-102, RM-8143, FCC 96-264, 61 Fed. Reg. 40348 (Aug. 2, 1996).

market.<sup>2</sup> In its Report and Order, however, the Commission has adopted rules and proposed others that may well have disparate and significant, while unintended, consequences based on an operator's technology at a time that many operators have already committed substantial resources to the development of their technologies. Omnipoint believes that the Commission can avoid these consequences by modifying its E911 rules as described below.

**I. The Definition of "Mobile Identification Number" Should Be Technologically Neutral**

The Commission should modify the definition of "Mobile Identification Number," ("MIN") 47 C.F.R. § 20.3, to ensure that the E911 rules apply to all CMRS operators in a technologically neutral fashion.<sup>3</sup> As presently drafted, the definitions cannot easily be adapted to either PCS-1900 or IS-661 technologies. Because Section 20.18(b) of the Commission's rules imposes different requirements for 911 calls from PCS phones based on whether or not a Code Identification is transmitted, it is critical for the Commission to modify its rules so that they apply independent of the operator's technology choices.

---

<sup>2</sup> Second Report and Order, 8 FCC Rcd. 7700, 7755-56 ¶ 135-137 (1993); *aff'd*, Memorandum Opinion and Order, 9 FCC Rcd. 4957, 5021-22, ¶ 162 (1994); *recon. granted in part, denied in part*, Third Memorandum Opinion and Order, 9 FCC Rcd. 6908, 6919 ¶ 66 (1994).

<sup>3</sup> Section 20.3 of the Commission's Rules adopt two new definitions:

Code Identification. A Mobile Identification Number for calls carried over the facilities of cellular or broadband PCS licensees, or the functional equivalent of a Mobile Identification Number in the case of calls carried over the facilities of a Specialized Mobile Radio Services.

Mobile Identification Number. A 34-bit number that is a digital representation of the 10-digit directory telephone number assigned to a mobile station.

Specifically, the current MIN definition -- “a 34-bit number that is the digital representation of the 10-digit directory telephone number assigned to a mobile station” -- is not technology neutral because a 34-bit number exists only in some cellular and PCS technologies, and not in others. For example, in both the PCS-1900 technology currently used or proposed for use by many PCS licensees and the IS-661 technology developed by Omnipoint, mobile stations are uniquely identified by an International Mobile Subscriber Identity ("IMSI") number. The IMSI is a 15-digit number which, for reasons of network security and fraud prevention, does not contain the directory telephone number of the mobile station.<sup>4</sup> The association between the IMSI and the directory telephone number (known as the Mobile Station Integrated Services Data Network ("MSISDN" number) is made only in the home location register ("HLR") database of the customer's home network. In certain cases, a mobile station may not even possess a valid MSISDN, even if it has a valid IMSI. Therefore, even valid subscribers in PCS 1900 networks presently under construction are not able to transmit a “Code Identification,” as currently defined, when they make 911 calls (or any other call).

The intent of the Commission would be better served, and the definition of Code Identification would become technology independent, by modifying the definition of MIN to the following:

**Mobile Identification Number.** A unique identifier assigned to a mobile station, from which the serving network operator may determine the directory telephone number (if any) assigned to the mobile station.

---

<sup>4</sup> Indeed, for even greater network security, the IMSI is normally not transmitted. Rather a mobile station is assigned a Temporary IMSI, or TMSI (Temporary Mobile Subscriber Identity) for over-the-air signaling.

## **II. Distinctions Between Calls With and Without a Valid Code Identification Should Be Removed**

Section 20.18(b) of the Commission's rules requires PCS operators to treat 911 calls in one of two different ways: (1) *calls with a Code Identification* must be routed to the designated Public Safety Answering Point ("PSAP"); (2) *calls without a Code Identification* must be routed to the designated PSAP only if requested by the administrator of the PSAP, and that PSAP is capable of receiving and utilizing the data elements associated with 911 service. The Commission should reconsider this bifurcated treatment of calls and instead require PCS operators to use best efforts to forward all 911 calls to the designated PSAP, whether or not the call transmits a valid Code Identification.

Section 20.18(b), as currently drafted, raises two related problems for PCS operators that were not adequately addressed in the Report and Order. First, the Commission requires forwarding of 911 calls to the "designated" or "appropriate" PSAP without recognition that mis-routing is possible. Second, the Commission appears to require PCS operators to drop some 911 callers simply because the subscriber's handset does not transmit a Code Identification. This is an untenable situation for the PCS operator's liability and, quite frankly, imposes unnecessary public safety risks.

### ***A. The Operator Should Be Responsible for "Best Efforts" Routing to the "Designated" PSAP But No More***

The Commission's rules require PCS operators to route 911 calls to the "designated Public Safety Answering Point." 47 C.F.R. § 20.18(b). In practice, however, determining the appropriate PSAP to which a given mobile call must be routed can be a difficult process. For example, a PCS system may operate within multiple PSAPs, some of which will have different unidentified call policies. OCI, in its NY MTA license area, must deal with one state-wide PSAP in New Jersey, at least four regional PSAPs in lower New York State, and one PSAP per county in Pennsylvania. These PSAPs do not have a

uniform unidentified call policy. Although OCI can route calls by cell of origination, when location-based routing is later required by Section 20.18(d) of the rules, location determination will be imperfect at best. As a result, some percentage of unidentified calls will be blocked when they should not be, based upon incorrect location information.

However, Section 20.18(b) as written places the PCS operator in an untenable situation; an unidentified 911 call must be accepted or rejected depending upon the location of the caller, while the current technology to ascertain the caller's location is imprecise. (See Section IV, below.) Two examples demonstrate the problem:

Example 1. The calling party is in a location served by PSAP A, which accepts all calls. The PCS network identifies the location as one served by PSAP B, which refuses unidentified calls. The call is rejected by the PCS network and the calling party is unable to receive help.

Example 2. The calling party is in a location served by PSAP B, which refuses unidentified calls. The PCS network identifies the location as one served by PSAP A, which accepts unidentified calls. The call is initially accepted by PSAP A and then may or may not be properly transferred by PSAP A to PSAP B.

Although OCI and, we are sure, other PCS operators will use their best efforts to properly locate and route 911 calls, it is a technological reality that some callers will be mislocated. Therefore, Omnipoint believes that the best solution in the interest of public safety is to require each PCS operator *to route all calls to the appropriate PSAP*, as best as it is reasonably able to determine.

***B. Routing to the Appropriate PSAP Will Serve the Public Interest and Limit Licensees' Potential Civil Liability***

While the Commission's rules are followed in either Example 1 or 2 above, the Commission's public interest goals are thwarted. The objective, after all, is to assure that customers with an emergency can call 9-1-1 and obtain a swift and efficient connection to



trained local emergency personnel. It is most certainly not in the public interest, or in furtherance of the Commission's obligation to promote "safety of life and property,"<sup>5</sup> to block connection to PSAPs, as may otherwise occur under the Commission's current rules (see, e.g., Example 1, above). While the Commission's rules presumably allow callers in distress to be dropped by the PCS operator, such a situation could well pose untenable liability risks for the operator. Therefore, Omnipoint disagrees with the Commission's view at ¶¶ 98-101 of the Report and Order that carriers do not require federal liability limits. Without such limits, state tort actions brought against carriers could well interfere with federal priorities for a workable long-term E911 system,<sup>6</sup> and for the rapid introduction of more competitive mobile services. 47 U.S.C. § 309(j)(3)(A) & (B).

Although the Commission suggests at ¶ 99 of the Report and Order that PCS operators could limit their liability through contract, this alternative fails to get to the root of the public safety issue.<sup>7</sup> Moreover, as a practical matter, the trend in the industry is away from signed contracts for service in which a carrier may be able to limit its liability for mishandling 911 calls. Omnipoint, in steeped competition with other CMRS operators, is unlikely to require a written contract from its customers. Further, even if a PCS operator did have a contract with its customers, it would not have a written agreement with roamers or with persons owning un-subscribed handsets. Thus, the

---

<sup>5</sup> 47 U.S.C. § 151.

<sup>6</sup> Cf., Report and Order at ¶ 104-05 (Commission will preempt incompatible intrastate E911 requirements).

<sup>7</sup> Omnipoint fails to see why the Commission, recognizing that wireline LECs are afforded liability immunity through the tariffing process, will not offer CMRS operators similar protections through its rules. As the Commission is well aware, tariffing is not an option for CMRS, 47 C.F.R. § 20.15, and so the exemption for wireline operators is contrary to the Commission's mandate to eliminate regulatory entry barriers for CMRS competitors to the incumbent LECs. See 47 U.S.C. § 257.

Commission's rule requiring the PCS operator to actively block some 911 calls is inconsistent with public safety and is contrary to the Commission's long-standing commitment to encourage (not hamstring) the rapid deployment of competitive PCS systems. If the Commission insists on retaining its blocking rule, however, then the Commission should accept that responsibility and adopt a rule that either (a) explicitly exempts PCS operators from liability or (b) requires network operators to not accept 911 calls without a valid Code Identifier. Either of these alternatives would be preferable to Section 20.18(b) adopted in the Report and Order.

***C. Proposed Alternative Rule Changes To Improve Public Safety and PCS Liability Issues***

For the reasons stated in Subsections A and B above, Omnipoint suggests that the Commission reconsider Section 20.18(b) and revise it to read as follows:

As of [one year after the effective date of the rule], licensees subject to this section must process all 911 calls, whether or not such wireless calls transmit a Code Identification and shall use commercially reasonable efforts to route the call to the appropriate Public Safety Answering Point.

Alternatively, the Commission could revise Section 20.18(b) to read as follows:

As of [one year after the effective date of the rule], licensees subject to this section must process all 911 calls transmitting a Code Identification and shall use commercially reasonable efforts to route the call to the appropriate Public Safety Answering Point. 911 calls not transmitting a Code Identification shall not be accepted by licensees subject to this section.

The corollary to requiring PCS operators to accept all 911 calls is that the PSAP must also accept unidentified calls from PCS systems. Given the Commission's pervasive statutory authority to regulate CMRS <sup>8</sup> and its statutory obligation to regulate

---

<sup>8</sup> 47 U.S.C. § 332.

wire communications to promote the safety of life and property,<sup>9</sup> Omnipoint believes that the Commission does have the authority to so act. While the Commission has properly shown great deference to the inherently local nature of public safety arrangements, in the instance of calls originating on an interstate wireless radio system, it is appropriate and proper for the federal interest to require PSAPs to accept all such calls.

### **III. TTY Requirements Must Be Further Clarified**

There are several problems with implementing Section 20.18(c) as adopted in the Report and Order,<sup>10</sup> such as telephone number differences for Text Telephone Devices ("TTY") service and the lack of standard solutions for transmission of TTY data calls over wireless networks. Omnipoint requests that the Commission modify its rule to reflect that operators can satisfy their obligations through short-messaging service, and through analog TTY when reasonably feasible. Given the complex technical issues that have yet to be resolved, Omnipoint suggests that the Commission revise Section 20.18(c) of its rules to read as follows:

As of [one year after the effective date of the rule] licensees subject to this section must be capable of transmitting 911 calls from individuals with speech or hearing disabilities through means other than normal speech over a mobile radio handset. Acceptable methods of demonstrating compliance with this requirement include handset keypad-originated text messages or data services compliant with international standards. To the extent reasonably

---

<sup>9</sup> 47 U.S.C. § 151.

<sup>10</sup> Section 20.18(c) adopted in the Report and Order requires non-voice 911 calls to be transmitted by PCS systems:

As of [one year after the effective date of the rule], licensees subject to this section must be capable of transmitting 911 calls from individuals with speech or hearing disabilities through means other than mobile radio handsets, *e.g.*, through the use of Text Telephone Devices.

feasible with the technology implemented by the operator, analog TTY service shall also be supported.

***A. Telephone Number Differences***

Not all PSAPs accept TTY calls at the 911 number. Instead, some PSAPs require TTY calls to be directed to a standard 7-digit number. Further, calls to an emergency 7-digit number are not recognized by the subscriber phone as being emergency and consequently will not override a handset lock and will not be transmitted without a valid SIM in the case of PCS-1900 or IS-661 technology.

The Commission should clarify that “911” means the specific digits 911, and should not be understood to be a shorthand reference to any other emergency number. Since the term “911” is not elsewhere defined by the Commission, TTY calls to a 7-digit emergency number are presumably not subject to the ANI and location information required by Section 20.18(d) and (e) of the rules.

***B. TTY Compatibility with Digital Systems***

Issues of compatibility between analog and digital systems need to be resolved before implementation of E911 services can be successfully completed. While analog modem transmission, such as used by TTY devices, is generally compatible with analog cellular technology, it is not guaranteed to be compatible with digital cellular or PCS techniques. Digital cellular systems digitize the speaker's speech using algorithms highly optimized for the human voice. Transmitting analog modem tones from either the Baudot format TTY or 300 baud ASCII TDD format devices over a digital radio system is not guaranteed to be successful. Modem tones are not voice and accordingly will not necessarily be accurately digitized and reconstituted at the receiving end.<sup>11</sup>

---

<sup>11</sup> Limited testing by Ericsson has shown that successful analog TTY communications is possible with the 13 kb/s “full rate” speech vocoder used in the PCS-

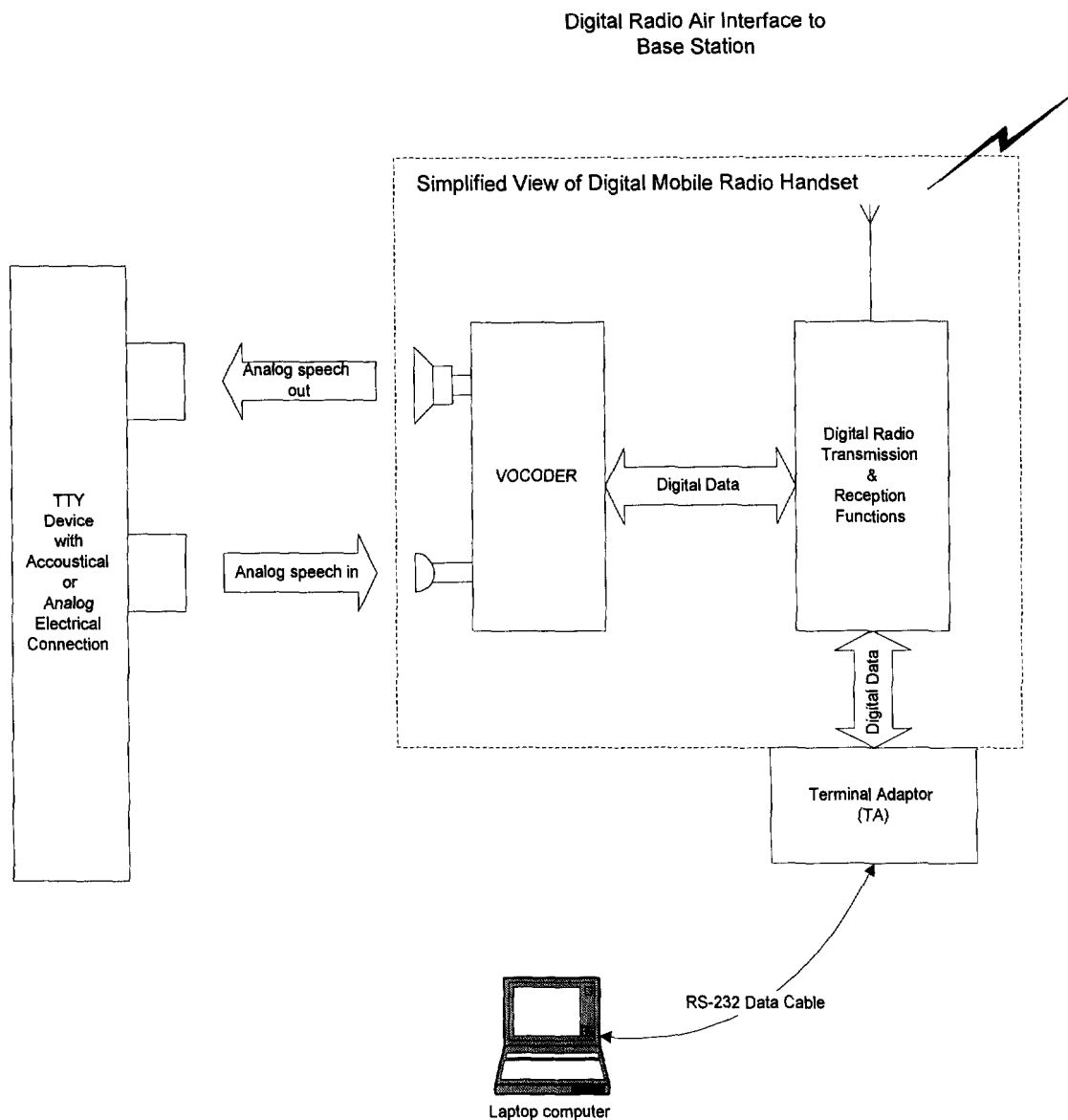
*(Footnote continued to next page)*

Both the PCS-1900 and IS-661 systems permit end-to-end data transmissions over a variety of common data standards, up to 9600 b/s for PCS-1900 and 64 kb/s for IS-661. However, transmission of these data rates requires the mobile data user to be connected directly into the data transmission components of the handset, through a device called a "Terminal Adapter," not through an analog modem-based device such as the TTY phone. This concept is illustrated below (Figure 1, below) in the simplified view of a digital mobile radio handset.

---

*(Footnote continued from previous page)*

1900 standard. However, the planned "half-rate" speech vocoder has not been tested and, moreover, preliminary tests show that the highly efficient sub-8 kb/s vocoder used in Omnipoint's IS-661 technology is unable to successfully transmit the TTY analog modem tones.



*Figure 1*

At the network end, a similar activity takes place, as illustrated in Figure 2. The digitized speech is converted to a standard analog telephone signal and placed into the public switched telephone network ("PSTN"). A data call that is connected to the mobile

station through a terminal adapter is carried digitally within the PCS network and is connected to the PSTN through a modem. To the mobile data user, the call appears to be functionally identical to a call made with a standard modem over a standard PSTN circuit.

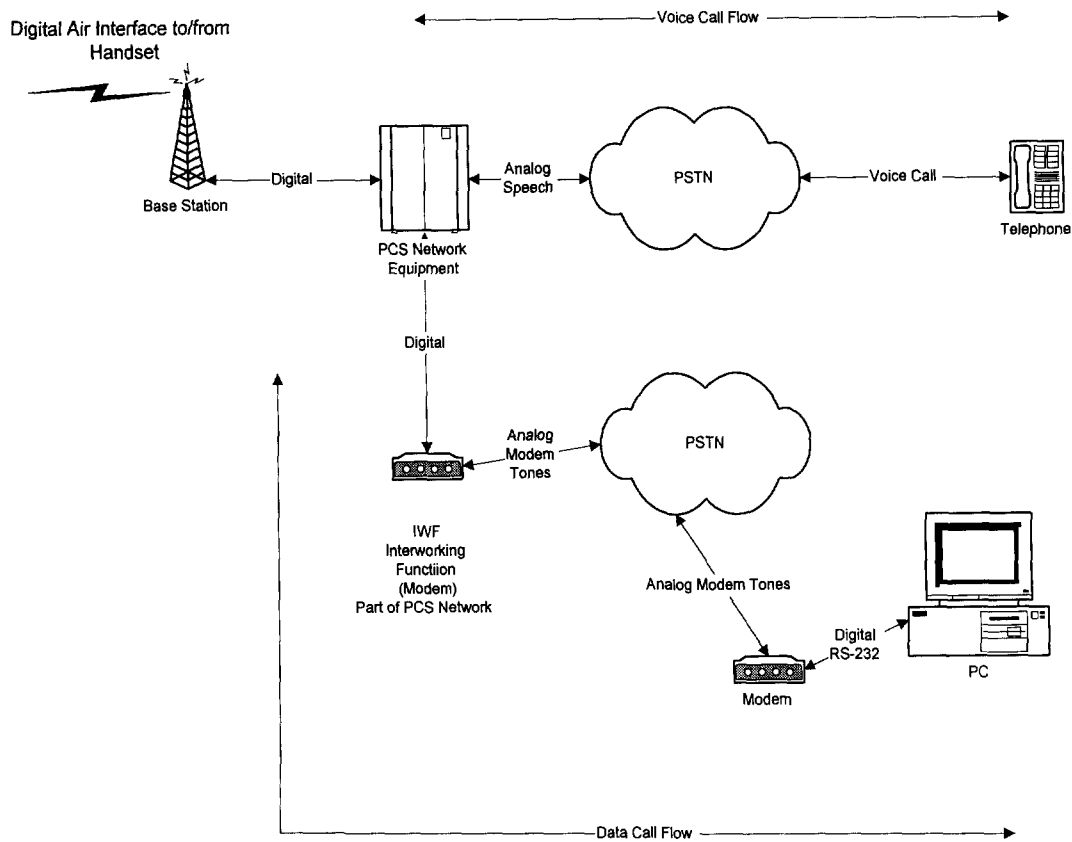


Figure 2

When a TTY phone user attempts to connect a TTY modem to the handset through either an acoustical coupler or an analog adapter that offers an RJ-11 connection into the analog transmit and receive portions of the handset, the handset vocoder interprets the modem tones as speech, digitizing the tones and passing them to the PCS network. The network then reverses the process and tries to convert the digitized information back to modem tones and sends them through the PSTN. This process is

fraught with difficulties and cannot be assured to work for all modems, all handsets or all networks.

An additional problem is that, unlike voice telephony, TTY modem tones are not tolerant of noise and momentary interruptions. In the case of voice telephony transmission over a digital mobile radio network, if the PCS signal enters a momentary fade, the vocoder “interpolates” from past speech attempts and predicts the missing sound pattern. If the fade lasts a bit longer, the vocoder inserts silence. In addition, a digital cellular phone sometimes inserts sound patterns that never originated with human lips at certain times during the predictive process. In voice telephony, callers can, of course, ignore the artifacts and still understand the conversation. TTY modem tones, however, are not tolerant of these artifacts.

In contrast, true data communications—through a terminal adapter and interworking function—are treated differently within the PCS network. The data bits are protected from corruption through a combination of redundant coding and “repeat until correct” (ARQ) techniques. See Figure 2, above. The ability of the TTY user to connect a TTY display unit to a digital PCS phone through a terminal adapter is, unfortunately, limited by the fact that older TTY display units only have analog connections and do not have the RS-232 data port functionality needed to mate with the terminal adapter.

Unfortunately, using the advanced data capacity of PCS-1900 networks to communicate with a PSAP by data link does not currently offer a significant end-user benefit because few, if any, PSAPs are able to accept a data call other than a 300 b/s ASCII call from a TTY phone. Indeed, it is not clear that all PSAPs can accept the 300 b/s ASCII type TTY call, as some appear to have only implemented the older 45.45 baud Baudot standard devices, as a default standard, since the newer TTY user devices retain



compatibility with the older Baudot implementation.<sup>12</sup> More modern TTY devices that also function with the 300 b/s ASCII format use a standardized modem and, if equipped with an RS-232 serial data port, are capable of communicating over a PCS network in a fully digital data mode, *i.e.*, using a terminal adapter at the mobile station and using the interworking function at the network end of the connection.

### ***C. Short Message Service Could Provide A Workable Solution***

In addition to the classic data transmission function discussed above, digital PCS systems also permit users to exchange short digital messages -- "Short Message Service," or SMS. PCS-1900 phones permit a written SMS message to be prepared using the keypad on the handset. For example, once in the SMS mode, pressing the "2" key once gives the letter "A," and pressing it twice gives the letter "B." After a SMS text message is composed, it may be sent to another PCS phone or, through the "Short Message Service Center," which is a part of most PCS networks, to other destinations, such as e-mail. It is also possible for the user to connect a computer or other data device to a PCS-1900 handset and compose a SMS message more efficiently than through the handset keyboard.

Few, if any, PSAPs are currently configured to accept either SMS directly or e-mail emergency messages, but over time SMS may be useful and should be promoted as a method of transmitting emergency calls by the hearing and speech impaired. It will, of course, be necessary for the PSAPs to be suitably equipped for SMS communications.

---

<sup>12</sup> PCS-1900 and IS-661 have only implemented a limited number of standardized data rates and modem types. Unfortunately, the 5-level 45.45 b/s Baudot code used in the older TTY display units has not been implemented as a standard bit rate and data structure as Baudot is an obsolescent standard and has not been used in new systems for decades. Nor has the TTY United States modem been adopted as an international standard unlike the data protocols.

#### **IV. Relax the Applicability of Section 20.18(d).**

Omnipoint believes that the feasibility of providing 125 meter radius location accuracy is limited by both technological and financial considerations.<sup>13</sup> The Report and Order incorrectly judged the practicability of this location accuracy for digital PCS systems operating at 1.9 GHz. While many approaches to radio positioning have been developed, almost all fall into one of three categories: bearing;<sup>14</sup> time of arrival;<sup>15</sup> and combined bearing/time of arrival.<sup>16</sup> Section 20.18(d) of the rules, however, fails to reflect the differences in the feasibility and accuracy radio positioning in different PCS

---

<sup>13</sup> Section 20.18(d), adopted in the Report and Order, requires transmission of certain geographic location information to the PSAP:

As of [five years after the effective date of this rule], licensees subject to this section must provide to the designated Public Service Answering Point the location of a 911 call by longitude and latitude within a radius of 125 meters using root mean square techniques.

<sup>14</sup> Bearing is the classical “triangulation,” where the bearing (azimuth) of the mobile signal is determined by one of several means (mechanically rotating directional antenna, fixed antenna pseudo-Doppler, etc.). Triangulation requires at least two different sites to produce an unambiguous “fix” on the mobile position, although accuracy is improved with additional sites. (In certain cases, e.g. where the two base stations are in a straight line to the mobile station, two bearings are not enough to establish the mobile station's location.)

<sup>15</sup> Time of arrival is the classical “trilateration” whereby measurement of the difference in propagation delay from multiple base stations permits determining location. Trilateration requires at least three different sites to produce an unambiguous “fix” on the mobile position. Arrival time from two base stations yields two possible positions.

<sup>16</sup> Combined Bearing/Time of Arrival is the knowledge of the bearing and the distance (as determined from propagation delay) and permits an unambiguous “fix” on the mobile position from one base station site.

technologies. For these reasons, therefore, Omnipoint believes the Commission should reconsider its location requirement rule and instead adopt a flexible accuracy requirement that recognizes differences in technology:

As of [five years after the effective date of this rule], licensees subject to this section must provide to the designated Public Service Answering Point the location of a 911 call by longitude and latitude. The licensee shall implement the location function using the best commercially reasonable techniques consistent with the licensee's transmission technology. Nothing in this Section, however, shall require a licensee to construct base station sites not needed to meet the licensee's coverage objectives.

The AMPS analog cellular technology is moderately well suited to either triangulation or combined positioning. With AMPS, a narrow-band carrier is radiated by the mobile station as long as the call is connected, which makes the bearing to the mobile station relatively easy to measure. In addition, an analog AMPS mobile station transponds or repeats the base station originated 6 KHz supervisory audio tone (SAT), with a time delay tolerance specified in the AMPS standard. Thus, the base station may compare the phase of the received SAT with the transmitted SAT and determine the range. A ranging accuracy on the order of a few hundred meters is reasonable. Likewise, where the base station has an unobstructed path to the mobile station, a bearing accuracy of  $\pm 2.5$  degrees is achievable at 800 MHz cellular frequencies. At 10 km from the base station, therefore, the mobile station could be located within a roughly rectangular box with dimensions of 435 meters by 500 meters, based upon measurements from one base station only. If the mobile station can be heard by one or more additional base stations, the area of uncertainty can be further reduced through additional bearing data.

While Omnipoint is most familiar with the technical capabilities of its own technology, IS-661, as well as GSM, or PCS-1900, Omnipoint is confident that other digital PCS systems will have similar problems. The PCS-1900 and IS-661 technologies

used by Omnipoint and other digital PCS licensees do not offer the same opportunities for automatic location for several reasons.

- PCS-1900 employs frequency hopping, at 216 hops/second, which means that any direction finding equipment must track the hopping sequence. Whilst the hopping sequence is known to the base station, and thus in principle can be known by the direction finding receiver, designing a frequency hopping receiver is much more complex than in the analog AMPS case.
- PCS-1900 is a TDMA system, with a mobile system only transmitting for 577 microseconds. This is a very short time indeed to determine a bearing. IS-661 is a hybrid TDMA/CDMA system, posing similar problems to measure a bearing angle.
- PCS-1900 implements discontinuous transmission, whereby when the calling party is not speaking, no signal is transmitted by the mobile station. Thus, a signal is detectable only about 40% of the time.
- PCS-1900 and IS-661 employ relatively broadband emissions. For example, PCS-1900 uses 200 KHz bandwidth, with IS-661 using an even greater bandwidth. In urban and suburban areas, reflections from the wide spectrum spread limit the accuracy of direction finding bearings.
- The higher frequency band of PCS systems (1.85 GHz vs. 850 MHz for cellular) limit accuracy of bearings because of increased reflections from the local environment.
- Neither PCS-1900 nor IS-661 permit SAT ranging. While both do generate range data, the data is relatively coarse, with one range step being 550 meters for PCS-1900.
- PCS-1900 systems are designed with very low antenna heights and small cell radius in urban areas. For a host of efficiency reasons, Omnipoint, for example, is mounting its antennas only 7 to 15 meters above ground. These antennas are not clear of urban clutter and thus are not suited for azimuth bearing determination.
- PCS-1900 systems are not designed for major overlap. Experience with similar systems shows that only about 50% of calls will be in an area with two or more different base stations offering acceptable service, thereby

ruling out any system (triangulation or trilateration) requiring multiple sites to determine position.

For the reasons developed above, any approach that requires azimuth bearing is not suited for PCS-1900 systems.<sup>17</sup> Without major changes to base station hardware or mobile station hardware and software, the most that is quickly achievable is sequential timing advance measurements from multiple base stations, for those areas where more than one base station provides adequate signal. The mobile station is assigned to handover to each potential handover candidate. However, because the mobile station is already on the strongest base station, at the time the 911 call originated, each handover fails and the mobile returns to the original serving cell. Each handover attempt, however, provides a timing advance measurement for the target cell. Unfortunately, each attempted handover carries with it a chance that the call will be dropped.

The most promising location approach for PCS 1900 technology is through synchronized base stations, whereby the mobile station measures the timing advance to potential handover candidate cells and routinely reports the timing advance values to the base station, without the necessity of an attempted handover. This requires Phase II compliant mobile stations and, more importantly, requires precise time synchronization across base stations. Achieving the necessary time synchronization is major problem. GPS receivers are not feasible in "urban canyons" such as Manhattan. It is cost prohibitive to equip each BTS with a Stratum I clock.

Even the synchronized base station approach requires multiple overlapping coverage. Omnipoint does not believe that its network, or those of other PCS providers,

---

<sup>17</sup> Consultation with PCS-1900 network equipment suppliers Ericsson and Northern Telecom indicate that neither is willing to guarantee that PCS-1900 systems can meet the Commission's 125 meter requirement.

will provide the necessary three-deep overlapping coverage for more than 50% or so of calls. Equally important, synchronized base stations do not permit resolving distances finer than the 550 meters corresponding to one timing advance unit for any single base station. Thus, we request the Commission to modify its rule as noted above.

**V. Funding of Network Improvements**

Omnipoint is concerned that Section 20.18(f) of the rules provides insufficient assurance that PCS operators will be adequately or timely compensated for the expenditures needed to bring their systems into compliance with the Commission's E911 rules.<sup>18</sup> It is unclear whether the cost recovery mechanism envisioned by the Commission would require the PSAP to fund the entire network change or simply pay a pro-rata share. It also is ambiguous whether the PSAP must make adequate funds available to pay for network changes as they are made, or whether a promise of funding, to be paid over a term of years, is enough to trigger Section 20.18(f) obligations of the PCS operator.

Omnipoint will likely deal with several dozen PSAPs within its MTA and BTA license areas. All of the ANI-related features and significant parts of the location features required by the rules are switch-based, not base station based and thus affect all of the network. Certain parts of the location features may involve base-station-by-base-station changes. Under Section 20.18(f), one PSAP within Omnipoint's service area could force

---

<sup>18</sup> Section 20.18(f) provides:

The requirements set forth in paragraphs (d) and (e) of this section shall be applicable only if the administrator of the designated Public Service Answering Point has requested the services required under those paragraphs and is capable of receiving and utilizing the data elements associated with the service, and a mechanism for recovering the costs of the service is in place.

changes in Omnipoint's switch hardware and software. It would obviously be unfair to the PCS operator if one PSAP, representing, for example, 1% of the total service area, triggered a multi-million dollar change in network software, with the PCS operator being compensated only for 1% of its costs.

As the Commission well knows, PCS operators, and especially small businesses like Omnipoint, do not have unlimited access to capital. Rather, if new small business PCS entrants are to succeed, they must target their financial resources at those opportunities available to them. However, if the PCS operator must fund enhanced 911 network changes against a promise of future payment, some other profit-producing portion of the PCS network must be delayed. Thus, any enhanced 911 changes that are not immediately funded 100% carry an element of lost business opportunity to the PCS operator which, in turn, incrementally slows the rapid introduction of PCS for the American public. If PCS operators are forced to finance PSAPs, they should be compensated for this loss at their internal cost of capital.

Omnipoint suggests, therefore, that the Commission reconsider and revise Section 20.18(f) to read:

The requirements set forth in paragraphs (d) and (e) of this section shall be applicable only if the administrator of the designated Public Service Answering Point has requested the services required under those paragraphs and is capable of receiving and utilizing the data elements associated with the service, and a mechanism for recovering all of the licensee's costs of providing the service is in place. Licensees shall be entitled to recover both capital and operating costs. Where the funding mechanism does not provide for immediate compensation for all capital costs incurred by the licensee, the licensee shall be entitled to compensation for financing those costs, in the amount of the operator's internal cost of capital.

**Conclusion**

Omnipoint shares the Commission's concern for the implementation of E911 services, and for the safety of users of its system. The rule modifications and classifications urged in this Petition are offered so that PCS operators can more effectively offer all PCS services, including E911.

Respectfully submitted,

OMNIPOINT COMMUNICATIONS, INC.

By:



Mark J. Tauber

Kecia Boney

Mark J. O'Connor

Piper & Marbury L.L.P.

1200 19th Street, N.W.

Seventh Floor

Washington, D.C. 20036

(202) 861-3900

Its Attorneys

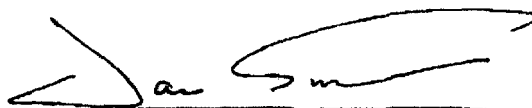
Date: September 3, 1996



**Certification of Jack Smith**

I, Jack Smith, certify under penalty of perjury that the following is true and correct:

1. I am a qualified engineer and consultant hired by Omnipoint Communications, Inc. ("OCI") to assist in the deployment of OCI's PCS network in the New York MTA;
2. I have reviewed the Commission's Report and Order, CC Dkt. No. 94-102 (rel. July 26, 1996) concerning enhanced 911 and I have reviewed OCI's attached "Petition for Reconsideration and Clarification" ("Petition");
3. The substance of the engineering matters stated in the Petition are accurate and correct to the best of my knowledge and belief.



Jack Smith

Date: 3 SEPTEMBER 1996